ROOF ANCHOR

FIELD OF THE INVENTION

This invention relates to devices and methods for providing a secure anchor point on a roof. In particular, the invention relates to a device and method for providing a portable anchor system on a roof for attachment and securing of safety harnesses for people, particularly workers, on the roof.

BACKGROUND OF THE INVENTION

The history of industrial safety is regularly punctuated with incidents of workers falling from roofs. The consequences are often fatal. The need for workers to be on roofs arises in a wide range of situations which necessitate professional services being supplied in that environment.

The range of trades people who are often required to negotiate the dangers of roof top work include plumbers, tilers, electricans, roofers, builders, painters, guttering tradesmen and air conditioning installers and maintenance operators. The danger associated with roof top work varies with the type of roof and weather conditions. Roofs which are formed of corrugated iron may be slippery particularly if coated in dust or when wet. Tiled roofs may provide a better frictional surface however they can also be slippery when dusty or when glazing is relatively new and smooth. One of the problems associated with working on pitched roofs is that if a person begins to slide there is little to arrest their decent as roof surfaces tend to be smooth. Some reliance is placed on the ability to connect with a gutter prior to slipping off a roof. However, such gutters are often poor targets during an uncontrolled descent and may also be inadequate for the purposes of stopping a person with release by or damage to the gutter and a subsequent fall.

In some buildings, gutters may be absent either as a design feature or due to

repair or maintenance of the gutter. The danger in this case is magnified. Accidents are by no means limited to professional service providers with a significant history of house owners suffering severe injury from falls as a result of attempting to perform minor maintenance tasks such as cleaning gutters.

Recent legislation in some jurisdictions has mandated the need to provide fall arrest systems when workers are on roofs. One form of such devices involves the erection of scaffolding around the lower edges of a roof thereby providing a safety barrier for any worker who has the misfortune to fall. Attempts have been made to use safety harnesses which are supported by safety lines tied to fixed anchor points. One difficulty arises in that such anchor points are relatively uncommon and are usually entirely absent from a roof. If a permanent anchor is fixed to a roof it suffers from the disadvantage of cost and lack of utility to the extent that it is unable to be moved. A series of such anchor points may be required to provide safe options for workers. These anchor points are costly to install. As they involve a breach in the integrity of the roof, considerable care must be used to ensure adequate application of flashing and sealing compounds to prevent leaks. Fixed anchor points are not generally available.

Some attempts have been made to produce an easily transportable roof anchor. Australian Petty Patent No. 712407 to Donohue *et al* disclosed a roof safety device attachable to the edge of the roofing material. The device has a first portion to extend over the top of roofing material, a second portion to extend across a front edge of the roofing material, a clamping portion and attachment means to allow a safety line to be fixed to the device. The attachment means is positioned at an end of the first portions, remote from the second portion.

The clamping portion described is positioned in the centre of the device. A hook shaped bolt or a flat metal bar are tightened into engagement with an underside of the roofing material. These arrangements substantially concentrate the restraining force at one position. If there is a weakness or flaw in, for example, an edge tile,

the attachment point may break away, potentially leading to displacement of the device and failure of the system.

A further problem may arise when the attachment line and user move laterally leading to a force in a direction that is not perpendicular to the roof edge. The safety device will tend to rotate, particularly with the single central point attachment. The lateral force will be exaggerated as the attachment point position causes a lever effect at the roof edge. This will tend to cause rotation around an edge of the plate abutting the roof edge. As such the device may lever its attachment off the roof edge. The risk is significant as a worker will usually need to range over a substantial portion of the roof thereby leading to generation of lateral forces on the safety device. The disclosed device also has an upper plate which will tend to easily slide over a roof surface when subject to lateral force.

WO 99/49154 to Gutter-Vac Bundaberg Pty Ltd discloses a roof safety system having a roof anchor adapted to be fixed to a roof edge. The roof anchor has a hook portion which is hooked to a lower edge of the roof cladding and a clamping bolt to fix it in position.

The roof anchor is of a T-shaped configuration, having a shank and a cross piece. The cross piece has a finger portion to engage under the bottom edge of the roof cladding. In this case a finger is used to form a slot for receiving an edge of the roof material. A clamping bolt is then tightened down onto the top of the material to fix it in position. Again the area of underside attachment is restricted leading to a concentration of applied forces, particularly in a vertical direction. If an upward vector is applied to the device, leveraged force may be applied to the roof edge. This may lead to damage of the roof edge, particularly if tile and possible dislodgment of the anchor. A hook or loop is provided at an outer end of the anchor again potentially leading to problems with lateral movement by a user, as the leveraged lateral force will act to destabilise the attachment to the roof.

The reference to any prior art in this specification is not, and should not be taken as, an acknowledgment or any form of suggestion that that prior art forms part of the common general knowledge in any country.

SUMMARY OF THE INVENTION

Throughout this specification, unless the context requires otherwise, the word "comprise", or variations such as "comprises" or "comprising", will be understood to imply the inclusion of a stated element or integer or group of elements or integers but not the exclusion of any other element or integer or group of elements or integers.

In one form, although it need not be the only form or indeed the broadest form, the invention resides in a portable anchor for use on a roof, the portable anchor comprising:

an attachment member adapted to attach to an edge region of the roof cladding;

a force distribution member extending transversely to the attachment member and adapted for location on an upper surface of the roof; and

a connection means mounted to the attachment member or the force distribution member, the connection means adapted to receive a load support line wherein the connection means is positioned in the vicinity of a junction between the attachment member and the force distribution member.

In the vicinity of the junction between the attachment member and the force distribution member may refer to a position at or intermediate the junction and a point midway along the length of the force distribution member. More preferably the position is at or intermediate the junction and a point ¼ along the length of the force distribution member.

Alternatively, or additionally, in the vicinity of the junction between the attachment

member and the force distribution member may refer to a position along the force distribution member and within 50 centimetres of the junction, more preferably within 25 centimetres and most preferably within 10 centimetres. The attachment means may be positioned on the attachment member, preferably at or around the junction.

The connection means is preferably located around an outer edge of the roof cladding, in use.

Preferably the attachment member is formed as an elongate member. The attachment member may have a gap formed by a first side structure and a second spaced side structure, the gap adapted to locate around an edge of the roof. The first side structure may be a wall structure. The first wall structure may be formed by a plurality of teeth like structures. The first side structure may be contoured to conform to a profile of the underside of the roof edge. The first side structure may be padded.

Preferably, the first side structure and second side structure form clamping means for clamping at least a part of the roof edge region in the gap. The attachment member may include a stop structure such as a wall positioned to engage the edge of the roof cladding during use. The stop structure may be continuous with the first side structure and may be positioned substantially between the first side structure and the second side structure.

The second side structure may be formed as a wall. The second side structure may be formed as one or more shaft members with a longitudinal axis oriented substantially perpendicularly to the first side structure. The one or more shaft members are preferably threadably engaged with support brackets thereby providing adjustment means for adjusting the gap.

The shaft members may have handles for easy operation and rotation of the shaft members in the support brackets.

The force distribution member is preferably formed as an elongate tubular member. The tubular member is preferably cylindrical. The cylindrical tubular member may be dimensioned to substantially occupy a corrugation in a corrugated roof. The force distribution member may be configured to fill or sit in a recess formed in roof cladding, such as a channel or valley.

The force distribution member is preferably substantially perpendicular to the attachment member. The force distribution member may be formed in any suitable shape. For example, it may be formed as a plurality of perpendicular members originating from the attachment member. In an alternative embodiment, the force distribution member may be formed as a planar member. The force distribution member may be formed to correspond with an outer shape of the roof. The outer shape may be corrugated. The force distribution member may be one or more out-rigger type devices originating from the attachment member.

The force distribution member may have a limited slip surface. The force distribution member may include padding on its roof contacting surface. The force distribution member may include a foot for engaging the roof surface.

The connection means is preferably an eye. The eye may be removably mounted in an aperture in the force distribution member. The eye may be formed in a plate fixed permanently to the force distribution member such as by welding. The connection means may be a shackle or hook mounted on the force distribution member. The connection means may be permanently fixed to the device.

The load support line may be a safety line.

The portable anchor may include a safety line fixed permanently to the connection

means. Preferably the safety line is releasably fixed to the connection means.

In a further aspect, the invention resides in a method of providing a roof anchor, said method comprising the steps of:

locating an anchor according to the above description with its gap situated around an edge region of roof cladding;

positioning a force distribution member of the portable anchor directed up the roof;

attaching a safety line to connection means of the anchor; and

attaching the safety line to a safety harness device for a wearer.

The method may include the step of positioning a stop structure, such as a wall, abutting an edge of the roof cladding. The method may further include the steps of tightening the first side structure and/or the second side structure to provide clamping engagement of a roof edge region. Tightening the first side structure and/or the second side structure may include the step of rotating threadably mounted members to advance their ends into contact with the roof surface. Alternatively, tightening the first side structure and/or the second side structure may comprise rotating one or more cammed locking catches to clamp the cladding material. The method may include locating two or more portable anchors on respective spaced roof edges.

In another aspect, the invention lies in a portable roof anchor comprising:

an attachment foot formed as an elongate "L" shaped bar;

two threaded bolts mounted for advancing or retraction by rotation and disposed transverse to one surface of the L bar or alternatively, cammed locking catches;

a cylindrical arm connected approximately centrally to the foot and extending normal thereto;

an attachment aperture formed in or mounted on the foot or the arm;

wherein:

the components are configured to compressively engage a roof edge region between one surface of the "L" shaped bar and the two threaded bolts or the cammed locking catches, with the arm positionable on the roof and the attachment aperture is in the vicinity of a junction between the attachment foot and the cylindrical arm.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a perspective view of a preferred embodiment of the portable anchor of the present invention.

Figure 2 is a perspective view of the device of Figure 1 highlighting the mechanism for attaching to an edge region of a roof.

Figure 3 is a side view of a clamp member of the portable anchor and bolt.

Figure 4 is a bottom view of the portable anchor of Figure 1.

Figure 5 is a perspective view of the roof anchor in operative position on a roof.

DETAILED DESCRIPTION OF THE DRAWINGS

Referring to Figure 1 there is a seen a portable anchor comprising an attachment member, a force distribution member and connection means in the form of eye 13. The attachment member is formed as an elongate foot 11 having a flat wall 14 and upright wall 15 forming an "L" shape in cross section. Spaced adjustable threaded shafts 16, 17 are supported by correspondingly threaded brackets 18, 19 respectively.

The upright wall 15 acts as a stop structure to abut an edge of the roof cladding. While the present example shows a continuous wall, it is clear to a skilled

addressee that other arrangements such as a perforate mesh, multiple fingers or interrupted sections of wall may be recruited.

The force distribution member is formed as a cylindrical tubular extension or arm 12 originating from a position around the centre of the attachment member in the form of elongate foot 11. The force distribution member is substantially in the form of an arm extending perpendicularly from the attachment member. The force distribution member seen as arm 12 has an offshoot tubular section 18 which receives eye 13.

Figure 2 shows a closer view of the elongate foot 11 with flat wall 14 and upright wall 15 in this case formed integrally. A suitable material is a length of angle iron. The flat wall 14 may form a first side structure. The brackets 18, 19 and threaded shafts 16, 17 may form a second side structure. The stop structure or wall 15 is positioned to act substantially between the first and second side wall structures.

The portable anchor may be formed of any suitable material. A preferred material is metal and preferably rust resistant metal. However, it is possible to form such an anchor in other materials including tough polymeric type materials which may have an advantage in low weight while maintaining substantial strength. The flat wall 14 forms a first side structure. The second side structure is formed, at least in part, by the ends of the adjustable threaded shafts 16, 17 which thereby define a gap into which an edge region of a roof may be located. The threaded shafts 16, 17 may then be adjusted into compressive contact by rotation of handles 20, 21 respectively. The force distribution member 12 is joined to the attachment member 11 so as to provide a space 22 between flat wall 14 and force distribution member 12 thereby allowing for location of the roof edge region in close proximity and preferably abutting contact with upright wall 15 which acts as stop structure. The upright wall 15 provides a stop or a resting point for an edge of the roof.

The planar lateral extension of the wall 14 distributes load along an underside of

the roof cladding thereby decreasing the risk of the anchor tearing upwards through a friable material such as tiles or shingles. Positioning the clamping shaft members 16, 17 towards the outer extremities of the attachment member 11 provides increased stability to the attachment to the anchor.

It is clear that there are many alternative embodiments suitable to provide the function of the present device. For example, the adjustable threaded shafts 16, 17 may be replaced by an adjustable wall member for clamping an edge region of the roof between the flat wall 14 and the adjustable wall. The flat wall 14 may be contoured to conform to the contour of a roof such as corrugated roof, a shingle roof, a tiled roof or any suitable form of material. The space 22 may be widened as required in such a device. The flat wall 14 and adjustable walls (not shown) may be formed with padding to provide a general clamping action which will self conform to the shape of the roof member. In one form, the edge attaching function may be performed by a U shaped channel formed in the attachment member.

Figure 3 shows a close up view of the threaded shaft 17 and handle 21. In this view, the threaded shaft 17 is adjusted down so the gap 23 formed by the first side structure in the form of flat wall 14 and second side structure in the form of the threaded shaft 17 is minimised. The clamping action is preferred as it protects against dislodgment of the anchor from the roof edge region and potentially catastrophic displacement of the device. The spacing of the gap 23 may be formed as required. When intended for use on thicker materials such as tiles, the brackets 18, 19 will be fixed so as to provide a greater variability in the gap 23.

Any suitable clamping mechanism may be used if required. In one embodiment, the clamping action may be induced by rotating handles fixed to cams such that increasing pressure is placed on the roof cladding surface. The cams may be pivoted on an axle which may be spring loaded to allow movement of the cam to allow full rotation of its associated handle into a locking position. The use of such cammed locking catches may provide an efficient and easily used system for fixing

the anchor in position.

Figure 4 shows a distal end of the force distribution member 12 in which a roof contacting region is covered with a padded material 24 to minimise abrasion or other damage to the roof. The force distribution member 12 is shown in its preferred embodiment. However, it is clear to a skilled addressee that the force distribution member may be formed in any suitable shape such as one or more triangulated extensions or even a sheet or planar extension. The sheet may be formed so as to conform with the roof profile on which it is to be used. That profile may be in the form of a corrugated sheet. The padding is preferably formed of a non-slip material to encourage resistance to lateral displacement of the force distribution member.

A portable anchor of the present invention is displayed in operating position in Figure 5. The adjustable threaded shaft members 16, 17 are tightened into compressive contact with an end region 25 of the roof. The sheets of corrugated metal have edges in abutting contact with upright wall 15 thereby locking the device and preventing upwards movement. The force distribution member 12 is located in a corrugation 27 of the roof sheet or cladding 26. In this case the cylindrical member is a tube. A safety line 28 is locked to a snap shackle 29 which in turn is fastened to the eye 13. The eye 13 may be removably mounted in offshoot cylinder 30 and retained by means of a suitable locking means such as a grub screw.

As can be seen, the eye 13 is positioned in the vicinity or around the outer edge of the roof cladding 26. This position resists lateral movement of the device as the line 28 is moved laterally by a user in a harness. In some jurisdictions, a design limit for a fixing is provided at 30 degrees off perpendicular. In the present case, the application of force at 30 degrees will be resisted as will the tendency to rotate the anchor. The forces applied will be substantially transferred into a shear direction and not a lift direction. This position minimises the leveraged rotational

effect of applying force to the extremity of arm or force distribution member 12. The eye may be located in a bottom half of the arm 12. Preferably in the bottom quarter and most preferably around the junction of the arm 12 and foot 11. The eye 13 may be located around the edge of the cladding, in use.

The safety line 28 is connected to a safety harness for use by a worker. When a force is applied along the safety line 29, the force is transferred through eye 13 and cylinder 30 to result in a vector along the corrugation 27 and a rotational vector on the portable anchor 10. The force along the corrugation 27 is resisted by the longitudinal strength of the sheet 26. The arm 12 provides a mechanical advantage to a leverage effect to resist the rotational force which results in a diminished upward direction force on the foot 11 thereby reducing or minimising the tendency for the sheet 26 to lift by displacement of fixing screws 31. The foot 11 extends under the roof sheeting to secure it from any vertical lifting action and focus the load force into the end of the roof sheeting distributing the load along the length of the foot 11.

In a preferred method of using the present device, a portable anchor may be located on opposite sides of a roof to guard against a person falling in a direction towards a single anchor and thereby negating the safety of the device.

The present invention has clearly marked and significant safety advantages for a roof worker. In addition, the device provides a non-obtrusive and permanent method of providing safety for workers and may be readily transported from site to site. The portable anchor may be configured to suit different roof coverings such as tiles, colourbond, slate and shingles. The length of the force distribution member 12 may be varied as required and the positioning of the eye may be arranged to meet different requirements.

In one embodiment, different components are manufactured for releaseable engagement each with the other and providing a range of different options in the

component. For example, different profiles of the attachment means may be provided with different clamping members thereon. Different forms of the force distribution means may also be provided in a tubular form and/or in a planar style. These parts may then be mixed and matched as required.

Throughout the specification the aim has been to describe the preferred embodiments of the invention without limiting the invention to any one embodiment or specific collection of features. Those of skill in the art will therefore appreciate that, in light of the instant disclosure, various modifications and changes can be made in the particular embodiments exemplified without departing from the scope of the present invention. All such modifications and changes are intended to be included within the scope of the disclosure.